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Abstract

When economists have considered organizations, much attention has focused on the boundary of the firm, rather than its internal structures and processes. In contrast, this essay sketches three approaches to the economic theory of internal organization—one substantially developed, another rapidly emerging, and a third on the horizon. The first approach (pricing) applies Pigou's prescription: if markets get prices wrong then the economist's job is to fix the prices. The second approach (politics) considers environments where important actions inside organizations simply cannot be priced, so power and control become central. Finally, the third approach (path-dependence) complements the first two by shifting attention from the "between" variance to the "within." That is, rather than ask how organizations confronting different circumstances should choose different structures and processes, the focus here is on how path-dependence can cause persistent performance differences among seemingly similar enterprises.

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by Robert Gibbons

1. Introduction

When economists have considered organizations, much attention has focused on the boundary of the firm, rather than its internal structures and processes. In contrast, this essay focuses on three approaches to the economic theory of internal organization—one substantially developed, another rapidly emerging, and a third on the horizon.

The first approach (“pricing”) applies Pigou’s (1932) prescription: if markets get the prices wrong then the economist’s job is to fix the prices. The resulting models ask not only what prices should be attached to various actions inside organizations, but also what direct and indirect methods are available to set these prices. Because of its focus on pricing, this approach naturally addresses incentive contracts. Because it also considers indirect methods for setting prices, however, this approach also addresses many structures and processes within and between organizations, including job design, transfer pricing, and outsourcing.

The second approach (“politics”) considers environments where important actions inside organizations simply cannot be priced, directly or indirectly. As a result, power and control become central, as in models of battles for control, lobbying those in control, and so on. More generally, this approach views the organization as a decision process, so issues of gathering and communicating information naturally arise, in addition to issues of control and decision-making. The politics approach has received less attention from economists than has the pricing approach, but it has grown rapidly over the last decade, and it has interesting connections to earlier work outside economics.

Finally, the third approach (“path-dependence”) is not an alternative to either of the first two, but rather a complement to both. This approach shifts attention from the between variance to the within. That is, rather than ask how organizations confronting different circumstances should choose different structures and processes, the focus here is on how path-dependence can cause seemingly similar organizations to perform at persistently different levels. One important source of path-dependence connects to an important issue in both the pricing and politics approaches: relational contracts (i.e., agreements so rooted in the particulars of the parties’ circumstances that they cannot be written down and hence must be

self-enforced rather than adjudicated by outsiders such as courts). While both the pricing and politics approaches include work emphasizing the importance of relational contracts in steady-state outcomes, the path-dependence approach enriches the others by focusing on how the dynamics of building and changing relational contracts can affect which steady-state outcomes are reached.

These approaches have complementary work in other disciplines. For example, on politics, Milgrom and Roberts' (1988) model of influence activities echoes informal arguments in Crozier (1964), and the growing economic literature following Aghion and Tirole's (1997) model of delegation has important roots in the Carnegie school such as Cyert and March (1963). Similarly, on path-dependence, there is a long tradition in strategic management of understanding organizational capabilities as necessarily home-grown; see Penrose (1959), Richardson (1972), Winter (1988), Henderson and Clark (1990), Nelson (1991), and Teece, Pisano, and Shuen (1997), among many others.

Before considering any of these approaches to the economic theory of internal organization, however, I emphasize this essay's focus by beginning with a lightning review of the enormous literature on firms' boundaries (in order to depart from the latter thereafter).

1.1 "Theories of the Firm"

The economic literature on firms' boundaries is sometimes called "the theory of the firm." Coase (1937) posed the theory's defining question: which transactions are more efficiently conducted in a firm than in a market? Over the past several decades, two prominent theories of firms' boundaries have emerged: transaction costs (e.g., Williamson (1971, 1975, 1979, 1991), Klein, Crawford, and Alchian (1978); see also Tadelis (2010)) and property rights (e.g., Grossman and Hart (1986), Hart and Moore (1990), and Hart (1995); see also Segal and Whinston (2010)).

Although the prototypical question in the literature on firms' boundaries is Coase's make-or-buy decision, many related problems are also important, and the breadth of this set of problems accounts in part for the size and continuing growth of this literature. For example, near the prototypical question of vertical integration, there are studies of contracts in vertical relationships. In addition, there are questions in corporate strategy that might be labeled horizontal integration (where no division produces a physical input for another, but managerial processes might be shared across businesses). Finally, as was noted decades ago (e.g., Blois (1972), Richardson (1972)), there are aspects of the "institutional structure of production" (Coase, 1992: 713) that do not fit neatly within the simple dichotomy between

integration versus non-integration (whether vertical or horizontal), including networks of firms and other “hybrid” governance structures.

One indication of the huge impact that the theories of firms’ boundaries have had is that they have been applied in other fields within economics, including industrial organization, law and economics, international trade, and development economics. Furthermore, there are connections to fields within other social sciences, including economic sociology and positive political economy, as well as to management disciplines such as marketing (distribution channels), operations (supply chains), and international management (foreign direct investment). But the purpose of this sub-section is to bracket this entire literature—not only its prototypical application to Coase’s make-or-buy decision, but also its elaborations from vertical contracts to hybrid governance structures, not to mention its applications in other fields within economics and its connections to other social sciences and management disciplines.¹

1.2 *Inside Organizations*

For better and worse, only an economist would think that the first question about organizations should be “Why isn’t this activity happening in a market?” That is, Coase’s question is *one* of the important ones: if we fail to consider the possibility that activities observed in an organization might have been conducted in a market, then we ignore self-selection and hence risk attributing to organizations themselves properties that derive instead from the kinds of activities that actors choose to conduct in organizations; see Gibbons (2005a: 219-22) for further discussion. On the other hand, I fear that too much focus on Coase’s question (and too much description of the theory of firms’ boundaries as “the theory of the firm”) may cause economists and others to conclude that economics cannot or should not have anything to say about structures and processes inside organizations.

Fortunately, organizational economics is making significant progress beyond the study of firms’ boundaries. Some of the issues being considered can be grouped into themes such as decision-making in organizations (power, politics, culture, leadership), employment in organizations (performance pay, skill development, careers in organizations), structures and processes in organizations (hierarchy, decentralization, resource allocation, transfer pricing), and organizations other than firms (agencies, states, communities). In short, a summary of

¹ Interested readers might consult the relevant chapters from *Handbooks* such as Baum (2002), Gibbons and Roberts (2010a), and Smelser and Swedberg (2005). In particular, see Bresnahan and Levin (2010), Lafontaine and Slade (2010), and Ménard (2010) for evidence, which space constraints prohibit discussing here.

current and prospective work in organizational economics now focuses at least as much on activities within organizations as between.

Even just sketching this large literature on the economics of internal organization (not to mention its connections to other fields within economics, other social sciences, and management disciplines) would be an enormous task.² I therefore restrict attention to the three theoretical approaches described above. Even with this restriction, however, space constraints allow only quick summaries of elemental models, with many topics slighted or even omitted; for richer accounts of pricing, politics, and path-dependence, see Gibbons and Roberts (2010b), Gibbons (2010), and Gibbons and Henderson (2010), respectively.

Finally, before launching into these three approaches, I should note that, in addition to bracketing the large literature on firms' boundaries, I am also omitting an older but resurgent fourth theoretical approach to internal organization: models in the spirit of Marschak and Radner's (1972) team theory, which ignore incentives so as to focus on information gathering, communication, and decision-making; see Garicano and Van Zandt (2010) for an elegant and comprehensive discussion of the roots, accomplishments, and prospects of this fourth approach.

2. Pricing³

In some settings, Pigou's prescription makes terrific sense: if markets get the prices wrong, then the economist's job is to fix the prices. Furthermore, Coase (1937) gave economists reason to conjecture that firms exist where markets would have fared poorly. It may then seem a short step to suppose that, inside organizations, the economist's job is to fix the prices, perhaps via an incentive contract.

Apparently, however, economists are not able to create perfect prices (i.e., monetary incentives) inside organizations—since then the whole economy could be run as one gigantic firm. We therefore need an elemental model of imperfect incentives in organizations. The classic agency model (e.g., Mirrlees (1975/1999), Holmstrom (1979), and Grossman and Hart (1983)) derived its imperfection from the agent's risk aversion: a sufficiently steep slope in an incentive contract would create first-best incentives, but it would also impose excessive

² Again, see the three *Handbooks* for a start, especially Azoulay and Lerner (2010), Baker and Gil (2010), Banerjee, Hanna, and Mullainathan (2010), Baron and Kreps (2010), Brynjolfsson and Milgrom (2010), Camerer and Weber (2010), Gertner and Scharfstein (2010), Hermalin (2010), Ichniowski and Shaw (2010), Lazear and Oyer (2010), Moe (2010), and Waldman (2010) for evidence, which is necessarily omitted in what follows.

³ This section draws on Gibbons (2005a, b).

risk on the agent, so the optimal tradeoff between incentives and insurance involves incentives below the first-best level. More recently, however, agency theory has received new foundations, based on the empirical reality that principals often “get what they pay for” from their agents.⁴ We develop this elemental model of imperfect pricing in Section 2.1, noting that imperfect pricing arises from distortionary performance measures, even if the agent is risk-neutral (as we assume through this essay).

If the direct approach of incentive contracts produces imperfect prices, one then can ask whether indirect approaches can produce improved (if perhaps still imperfect) prices. Section 2.2 addresses this question, describing how asset ownership and other indirect instruments (such as job design, transfer pricing, and so on) can be important in the quest to create appropriate prices for various actions inside organizations.

All of the instruments described in Sections 2.1 and 2.2—whether direct or indirect approaches—are assumed to be formal, in the sense that the instrument can be enforced by a court. (For example, if the parties sign an incentive contract, then the indicated compensation will be paid.) In many settings, however, measurement and commitment problems interfere with formal instruments, so informal instruments merit attention. In particular, in ongoing relationships, the parties may utilize relational contracts. The advantage of a relational contract is that, since it need not be enforced by a court, it can be stated in terms that the court cannot assess. The disadvantage of a relational contract, however, is that it must be stated in terms that make the parties themselves willing to enforce it.

Section 2.3 returns to the direct approach of trying to create appropriate prices by using incentive contracts, but now we consider relational incentive contracts rather than the formal contracts of Section 2.1. If the parties are sufficiently patient (so that the shadow of the future outweighs the temptation to defect today) then they can achieve perfect incentives using a relational incentive contract alone. More realistically, if the parties are limitedly patient then they may use both a formal contract and a relational contract to create incentives that are superior to those that can be created using either kind of contract alone.

Finally, Section 2.4 offers a brief summary and assessment of the pricing approach.

2.1 Distortionary Performance Measurement

In 1975, Steven Kerr published “On the Folly of Rewarding A, While Hoping for B.” The argument was simple: you get what you pay for. I find Kerr’s observations (and much

⁴ See Section 2.2 of Lazear and Oyer (2010) for an introduction to the evidence on this point.

subsequent empirical work) deeply at odds with the classic agency model because the classic model fails to distinguish between what the Principal values and what the parties can measure. (Formally, in the classic model the Principal's profit (gross of wages) is y and the incentive contract is $w(y)$.) Throughout this essay, therefore, we reject a strong but unremarked assumption in the classic agency model—namely, that y can be called “output,” as though it could easily be measured. Because y reflects everything the Principal values (gross of wages), it might be more appropriately called the Agent's “total contribution,” suggesting that y cannot be easily measured (and so cannot be an argument in formal incentive contracts).

Even when contracts based on y are not available, there may be other contracts that can be enforced in court. These contracts are based on alternative performance measures—such as the quantity produced, with limited adjustment made for quality. Let p denote such a performance measure and consider an incentive contract $w(p)$, such as $w = s + bp$. As in the classic agency model, a steep slope (e.g., a large value of b) will create strong incentives, but now the Agent's incentives are to produce a high value of p , not of y .

The first economic models to analyze these issues were Holmstrom and Milgrom (1991) and Baker (1992). The elemental model we present here was developed by Feltham and Xie (1994); see Datar, Kulp and Lambert (2001) and Baker (2002) for enrichments and applications.

To begin, suppose that $y = a + \varepsilon$ and $p = a + \phi$. Then a contract based on p creates incentives to increase p and the induced action also increases y . But now suppose that there are two kinds of actions that the Agent can take, a_1 and a_2 , and assume that costs are separable:

$$c(a_1, a_2) = \frac{1}{2}a_1^2 + \frac{1}{2}a_2^2.$$

In this “multi-task” environment, if $y = a_1 + a_2 + \varepsilon$ and $p = a_1 + \phi$ then a contract based on p cannot create incentives for a_2 and so misses this potential contribution to y . Alternatively, if $y = a_1 + \varepsilon$ and $p = a_1 + a_2 + \phi$ then a contract based on p creates an incentive for the Agent to take action a_2 , even though a_2 is irrelevant to the Agent's total contribution. Finally, in an extreme case such as $y = a_1 + \varepsilon$ and $p = a_2 + \varepsilon$, a contract based on p may create no value at all (even though y and p will be correlated because of the common noise term ε).

Generalizing these examples, suppose that the technology of production is $y = f_1a_1 + f_2a_2 + \varepsilon$, the technology of performance measurement is $p = g_1a_1 + g_2a_2 + \phi$, the

contract is $w = s + bp$, and the payoffs are $y - w$ to the Principal and $w - c(a_1, a_2)$ to the Agent. The first-best actions, maximizing $E(y) - c(a_1, a_2)$, are thus $a_1^{FB} = f_1$ and $a_2^{FB} = f_2$.

The timing in this model is as follows. First, the Principal offers the Agent a compensation contract, $w = s + bp$.⁵ Second, the Agent either accepts the contract or rejects it in favor of an alternative employment opportunity with payoff U_0 . Third, the Agent chooses actions (a_1, a_2) , but the Principal cannot observe these choices. Fourth, unobserved events beyond the Agent's control (ε, ϕ) occur. Fifth, measured performance (p) is observed by the Principal and the Agent (and by a Court, if necessary). Finally, the Agent receives the compensation specified by the contract.

A risk-neutral Agent chooses a_1 and a_2 to maximize $E(w) - c(a_1, a_2)$, so the optimal actions are $a_1^*(b) = g_1 b$ and $a_2^*(b) = g_2 b$. To induce the first-best actions, the Principal would like to choose b to satisfy $g_1 b = f_1$ and $g_2 b = f_2$, but this is impossible unless $f_1/g_1 = f_2/g_2$. The optimal trade-off between these goals is

$$b^* = \frac{f_1 g_1 + f_2 g_2}{g_1^2 + g_2^2} = \frac{\|f\|}{\|g\|} \cos(\theta),$$

where θ is the angle between the vectors $f = (f_1, f_2)$ and $g = (g_1, g_2)$.

There are two important features in b^* : scaling and alignment, reflected by $\|f\|/\|g\|$ and $\cos(\theta)$, respectively. Scaling is intuitive but uninteresting. For example, if g_1 and g_2 are both much larger than f_1 and f_2 then the efficient contract puts a small bonus rate on p , as shown by $\|f\|/\|g\|$. Alignment, however, is the key to the model. As one example, if the f and g vectors lie almost on top of one another (regardless of their lengths) then the incentives created by paying on p are valuable for increasing y . As a second example, if the f and g vectors are almost orthogonal to each other then the incentives created by paying on p are almost useless for increasing y . More generally, the efficient contract has a larger bonus rate b when f and g are more closely aligned, as measured by $\cos(\theta)$.

2.2 Incentive Systems: Indirect Instruments

The value of the multi-task theory (including the specific “ $\cos(\theta)$ model” developed above) is not only that it captures the empirical reality that Principals often get what they pay for, but also that it motivates the search for other ways to improve incentives when the

⁵ To motivate the assumption of linear contracts, imagine that $p \in \{0, 1\}$ and $\text{Prob}(p = 1) = g_1 a_1 + g_2 a_2$, where f_1, f_2, g_1 , and g_2 are sufficiently small.

direct approach of formal incentive contracting is of only limited use. Two possibilities then arise: first, if the direct approach is imperfect, then indirect approaches may be of interest; second, if formal contracts are imperfect, then relational contracts may be of interest. We examine these two possibilities in this sub-section and the next.

2.2.1 *The Principal Principle*

One question that the classic agency model answers naturally is “Why doesn’t the Principal sell the Agent the firm?” In the classic model, the Principal could do this either by literally selling the Agent the right to receive the payoff y or by signing an incentive contract $w = s + by$ with the Agent where $b = 1$ (and $s < 0$ as the price the Agent pays for the firm). Either of these methods would create first-best incentives, but the Agent would also bear all the risk in y . In short, the Principal could sell the firm to the Agent but the parties choose not to do so.

In the $\cos(\theta)$ model, however, the Agent is risk-neutral. We therefore now provide a richer model that explains why the Principal should not sell the Agent the firm in the $\cos(\theta)$ model. Simply put, the reason is that, in a richer setting where both the Principal and the Agent take important actions to increase firm value, the Principal should be the actor whose performance is more difficult to measure.

Formally, suppose there are two actors ($i = 1, 2$), each of whom can take both a productive action (a_i) and a manipulative action (m_i). The actors’ collective contribution to firm value is $y = a_1 + a_2$, the available performance measures are $p_i = g_i a_i + m_i$ ($i = 1, 2$), and each actor’s cost function is $c(a_i, m_i) = (a_i^2 + m_i^2)/2$. Suppose actor i is the Principal and signs the incentive contract $w = s + b_i p_i + b_j p_j + b_{ij} p_i p_j$ with actor j . An optimal contract can then be derived from the logic of the $\cos(\theta)$ model: $b_i^* = b_{ij}^* = 0$ and

$$b_j^* = \frac{g_j}{1 + g_j^2}.$$

Because the Principal receives y (and the actors’ productive actions are additively separable in producing y), the Principal has first-best incentives. The total expected payoff is therefore maximized by having actor i be the Principal if $g_i < g_j$. Recalling that $p_i = g_i a_i + m_i$, we have derived the Principal Principle stated above: the Principal should be the actor whose performance is more difficult to measure (in the sense that θ would be larger if this actor were the Agent).

2.2.2 *The Agent as Employee or Contractor*

If the identity of the Principal has been established along the lines above, it remains to determine whether the Agent should be an employee or an independent contractor for the Principal. Inspired by Holmstrom and Milgrom (1991), we now enrich the $\cos(\theta)$ model from Section 2.1 by assuming that there is a machine that the Agent uses in producing y . The resale value of the machine (after it is used in production) is $v = h_1 a_1 + h_2 a_2 + \xi$. Like y , we assume that v is not contractible, so contracts continue to depend on only p . If the Principal owns the machine (so the Agent is an “Employee”) then the Principal’s payoff is $y + v - w$ and the Agent’s is $w - c$. Alternatively, if the Agent owns the machine (so the Agent is a “Contractor”) then the Principal’s payoff is $y - w$ and the Agent’s is $w + v - c$. In short, the parties now have two instruments to influence the Agent’s incentives—the formal incentive contract and ownership of the asset—and they need not use these instruments independently; to the contrary, we expect different formal contracts to be optimal depending on who owns the asset.

As stark illustrations of this incentive-system model, consider the following pair of examples.

Example 1: $y = a_1$, $v = a_2$, and $p = a_1$.

Example 2: $y = a_1$, $v = a_2$, and $p = a_1 + a_2$.

In Example 1 the parties are better off having the Agent own the machine, but in Example 2 the reverse is true. In fact, in these simple examples, with the wrong choice of asset ownership the parties face a “get what you pay for” problem, but with the right choice the parties can write incentive contracts that produce perfect prices (i.e., induce the first-best actions).

2.2.3 Other Models

There is now a collection of models describing indirect instruments that can be used to improve the prices for various actions inside organizations (e.g., Holmstrom and Milgrom (1991) on job design, Holmstrom and Tirole (1991) on transfer pricing, and Holmstrom (1999) on outsourcing; see also the discussion of incentives and control in Section 3.2). The overarching theme of these models is that no single direct or indirect instrument is likely to create perfect or even tolerable incentives, so multiple instruments are likely to be used in combination as an “incentive system” (Holmstrom and Milgrom, 1994).

2.3 Relational Incentive Contracts: Informal Instruments

In Section 2.1 we saw that the direct approach of incentive contracting produces imperfect prices when the available performance measures suffer from “get what you pay for” problems. In Section 2.2 we then saw that, when the direct approach produces imperfect results, indirect approaches such as asset ownership may be useful complements, perhaps even rescuing the possibility of perfect pricing. In this section we return to the direct approach of incentive contracting, now considering relational rather than formal contracts.

Relational contracting allows subjective assessments of the Agent’s performance to enter the incentive contract. For example, Fast and Berg (1975) describe Lincoln Electric, where (to this day) a piece-rate formula ties part of a worker’s pay to objective measures of the worker’s output, but about half of the worker’s pay is a bonus based on the supervisor’s subjective assessment of the worker’s cooperation, innovation, dependability, and so on. More generally, relational incentive contracts often play an important role in setting prices inside organizations—both directly through subjective bonuses and indirectly through the role of subjective assessments in raises, promotions, and continued employment. Furthermore, relational contracts have many other uses both within and between firms, beyond linking pay to performance.⁶ Finally, relational contracts will play important roles in Sections 3 and 4, so this is another reason to begin discussing them here.

To formalize the idea of relational incentive contracts, we sketch Bull’s (1987) model, as interpreted by Baker, Gibbons, and Murphy (1994).⁷ Consider a repeated game between a Principal and an Agent. In each period, the Agent chooses an unobservable action, a , that stochastically determines the Agent’s total contribution, y . For simplicity, suppose that y is either High ($y = H$) or Low ($y = L < H$) and that $\text{Prob}(y = H | a) = a$, where $a \in [0, 1]$. If total compensation is w , the Principal’s payoff is $y - w$ and the Agent’s is $w - c(a)$, where $c'' > 0$ and $c' \rightarrow \infty$ as $a \rightarrow 1$.

As motivated above, y cannot be objectively measured, but we now assume that y can be subjectively assessed and used in a relational contract. In particular, imagine that compensation contracts consist of a base salary (s) and a relational-contract bonus (B), where the Principal promises to pay B if the subjective assessment is $y = H$. The timing of events within each period is as follows. First, the Principal offers the Agent a compensation package

⁶ See Baker, Gibbons, and Murphy (2002) for citations to both (a) early work in the sociology and management literatures emphasizing the general importance of informal agreements both within firms and between, and (b) more recent work emphasizing the role of informal agreements in ostensibly formal processes within organizations (such as transfer pricing) and between (such as alliances).

⁷ See MacLeod and Malcomson (1989), Levin (2003), and Fuchs (2007) for further developments and MacLeod (2007) and Malcomson (2010) for syntheses of larger literatures.

(s, B) . Second, the Agent either accepts the compensation package (in which case s is paid) or rejects it in favor of an alternative employment opportunity with payoff U_0 . Third, if the Agent accepts then the Agent chooses an action at cost $c(a)$, but the Principal does not observe the Agent's action. Fourth, the Principal and the Agent observe the realization of y (but a court cannot). Finally, if $y = H$ then the Principal chooses whether to pay the Agent the bonus B specified in the relational contract.

In a single-period employment relationship the Principal would choose not to pay a bonus, so the Agent (anticipating the Principal's decision) would choose not to supply effort, so the Agent's contribution would be $y = L$. Suppose that $L < U_0$, in which case the Principal (anticipating the Agent's effort choice) would not pay a salary, so the Agent would choose not to work for the Principal.

But things can be different in an ongoing relationship. Formally, consider an infinitely repeated game in which both parties discount future payoffs at rate r . We focus on equilibria in which the Principal and the Agent play trigger strategies (roughly speaking, the parties begin by cooperating and then continue to cooperate unless one side defects, in which case they refuse to cooperate forever after).⁸

If the Agent believes the Principal will pay the bonus B then the Agent's optimal action, $a^*(B)$, satisfies $c'(a) = B$. If the Principal offers the minimum salary that the Agent will accept then the Principal's expected profit per period is

$$L + a^*(B) \cdot (H - L) - c[a^*(B)] - U_0 = V(B) - U_0 ,$$

where $V(B)$ is the expected gross surplus from the effort induced by the bonus B .

But should the Agent believe that the Principal will pay the bonus B ? If the Principal does not pay the bonus then her payoff is $H - s$ this period but zero thereafter, whereas if the Principal does pay the bonus then her payoff is $H - s - B$ this period but equal to the expected profit from the relationship thereafter. Thus, the Principal should pay the bonus if and only if

$$(H - s - B) + \frac{1}{r}[V(B) - U_0] \geq (H - s) + \frac{1}{r} \cdot 0 ,$$

or $B \leq [V(B) - U_0]/r$. In words, the reneging temptation must be smaller than the present value of the net surplus from the relationship.

⁸ Because $L < U_0$, these trigger-strategy equilibria entail optimal punishments (Abreu, 1988); see Levin (2003) for details.

Before leaving this elemental model of a relational contract, it is useful to note that if one tried to implement this model in practice, at least two subtle questions would quickly surface: (a) what constitutes bonus-worthy performance ($y = H$ in the model)? and (b) what constitutes an appropriate bonus (B in the model)? That is, this elemental model focuses entirely on the *credibility* of the parties' promises, ignoring potential imperfections in the *clarity* of these promises. As we will see in Section 4, there can be important interactions between these issues of clarity and credibility.

2.4 Summary and Assessment

In summary, the pricing approach suggests that some “prices” (monetary incentives) can be chosen in organizations (via bonus rates like b), but typically not for the right things (because of misalignment as reflected by θ). Indirect prices also exist (e.g., by allocating an asset worth v), but still are typically not perfect; likewise, relational contracts may be feasible, but *still* are often not perfect.

This section's compact exposition has slighted or omitted several aspects of the pricing approach, such as Holmstrom's (1982/1999) model of “career concerns” (i.e., incentives created by the agent's concern for his reputation in the labor market), as well as analyses that combine two or more of these elemental models. As a whole, the pricing approach delivers a rich account of structures and processes within and between organizations. Gibbons and Roberts (2010b) provide a richer discussion of these and other issues.

3. Politics⁹

In some environments, important actions simply cannot be priced, directly or indirectly. More specifically, there are no (useful) formal pricing instruments like those described in Sections 2.1 and 2.2. If the parties are sufficiently patient then it may be possible to develop relational contracts like those described in Section 2.3, but see Section 4 for further reasons why this direct but informal approach to pricing also has its limits, even when the parties are reasonably patient (because of the interaction between credibility and clarity suggested at the end of Section 2.3).

The absence of prices, however, by no means implies an absence of incentives. To the contrary, in such environments, those with power have incentives concerning what decisions

⁹ This section draws on Gibbons (2003, 2005a).

to take, those without power have incentives to lobby those who have it, and all actors have incentives to maintain or increase their power over time.

These issues of power and politics in organizations are widespread and important. For example, Knight (1921 (1964): 254) observed that the “internal problems of the corporation, the protection of its various types of members and adherents against each other’s predatory propensities, are quite as vital as the external problem of safeguarding the public interests against exploitation by the corporation as a unit.”

More recently, and closer to current economic modeling, Cyert and March (1963 (1992)) constructed political accounts of organizational behaviors in terms of individuals’ decision-making, beginning from the assertions that “people (i.e., individuals) have goals; collectivities of people do not” and “unresolved conflict is a conspicuous feature of organizations” (pp. 30 and 32). For example, Cyert and March anticipated the application of information economics to the study of organizations, arguing that

Where different parts of the organization have responsibility for different pieces of information relevant to a decision, we would expect ... some attempts to manipulate information as a device for manipulating the decision. ... [But] we cannot reasonably introduce the concept of communication bias without introducing its obvious corollary – “interpretive adjustment.” (pp. 79 and 85)

In short, compared to the traditional description of an organization in terms of an organization chart, Cyert and March suggested that “The kinds of models presented in this book describe the organization as a decision-making process” (p. 202).

Economic models of political behaviors in organizational decision processes have proliferated recently and are the focus of this section. On the other hand, relative to both the literature on firms’ boundaries (Section 1.1) and the literature on incentive systems (Section 2), the economics literature on organizations as decision processes is still at an early stage. This section’s style therefore differs from Section 2’s, because this literature has not yet coalesced around a set of canonical problems, not to mention around canonical models of these problems (such as the $\cos(\theta)$ model or the relational-contract model).

Section 3.1 considers models of political behaviors within fixed decision architectures (i.e., fixed specifications of how the decision process arrives at a decision). Section 3.2 then turns to models of political behaviors within endogenous decision architectures (i.e., the architecture is chosen to account for both the decisions and the political behaviors it will induce).

Section 3.3 returns to relational contracts, for two reasons. First, the abundant evidence from the sociology and management literatures on the widespread importance of relational contracts documents that incentive schemes are not their only application (and may not even be the leading one). Second, and specific to Section 3.2's discussion of endogenous decision architectures, there may be reason to interpret with caution the recent wave of models that assume that control is easy to reallocate within organizations.

Finally, Section 3.4 offers a brief summary and assessment of economic models of political behaviors in organizations.

3.1 Fixed Decision Architectures

The literature on political behavior in fixed decision architectures includes models of concentrated control (where one party controls all the relevant decision rights), distributed control (where different decisions are controlled by different parties, such as in team production or committees), and contested control (where control is not yet allocated to any particular party or parties, so battles for control ensue). For reasons of space, we focus mostly on one example of concentrated control.

3.1.1 Concentrated Control: Influence Activities

Milgrom and Roberts (1988, 1990) developed an early model of political behavior, emphasizing that those in control get lobbied. More specifically, they studied an Agent's incentives to undertake "influence activities" when the Principal controls a decision and would like to tailor the decision to the state of the world, but the Principal does not know the state and the Agent has an opportunity to influence the signal about the state that the Principal observes.

To capture some of Milgrom and Roberts' ideas, consider the following abstract model. The parties' payoff functions are $U_P(s, d) = -(d - s)^2$ and $U_A(s, d) = -(d - (s + \beta))^2$, where $\beta > 0$. (For example, the decision might be how much capital the Principal gives the Agent for a project and the state of the world might reflect the productivity of the project, so the Agent always wants more capital than the Principal would like to give, but not arbitrarily much more, lest the Principal expect an unattainable return.) Following Holmstrom's (1982/1999) model of career concerns, we assume that there is symmetric uncertainty about the state: neither the Agent nor the Principal has private information about s . The timing of the model is then: (1) the Agent chooses "lobbying" activities, $\lambda \geq 0$ at cost $k(\lambda)$; (2) the parties observe a public signal, σ ; (3) the Principal chooses a decision, $d \in D$; and (4) the

parties receive their payoffs, $U_i(s, d)$, where U_A is gross of lobbying costs. The public signal in stage (2) is $\sigma = s + \lambda + \varepsilon$. Both parties share the prior belief that s is Normally distributed with mean M and precision H (i.e., variance $1/H$) and ε is Normally distributed with mean zero and precision h . Because the state s is Normal, let $D = \Re$. Finally, the cost function satisfies $k'(0) = 0$, $k'(\infty) = \infty$, and $k'' > 0$.

The public signal σ is the crux of the model: even though neither party knows the true state, both parties care about how the decision relates to the state, so the Principal will try to extract from the signal whatever information σ might contain about s , prompting the Agent to try to move the realization of σ upwards. In equilibrium, however, the Principal correctly anticipates the Agent's attempts to influence σ and so correctly accounts for those attempts when interpreting σ as a signal about s , but the Agent nonetheless has an incentive to influence σ . In particular, even though the Principal is not fooled, the equilibrium level of lobbying cannot be zero (because if the Principal believed the Agent to be doing no lobbying, then the Agent would have a strong incentive to lobby).

More precisely, in stage (3) the Principal will choose $d = E_s[s | \sigma]$. If the Principal's conjecture about the Agent's lobbying is $\hat{\lambda}$, then DeGroot (1970) shows that

$$E_s[s | \sigma] = \frac{HM + h(\sigma - \hat{\lambda})}{H + h}.$$

In stage (2), the Agent therefore chooses λ to solve

$$\max_{\lambda \geq 0} -E_{s, \varepsilon} \left[\left(\frac{HM + h(\sigma - \hat{\lambda})}{H + h} - (s + \beta) \right)^2 \right] - k(\lambda),$$

which defines $\lambda^*(\hat{\lambda})$, the Agent's best response to the Principal's conjecture. In equilibrium, the Principal's conjecture must be correct, so imposing $\lambda^*(\hat{\lambda}) = \hat{\lambda}$ yields the equilibrium level of the Agent's lobbying activity. Denoting this equilibrium level of lobbying by λ^* , we have

$$2 \frac{h}{H + h} \beta = k'(\lambda^*).$$

Naturally, the equilibrium level λ^* increases with (a) the Agent's bias β , (b) the precision of the public signal h , and (c) the prior variance of the state $1/H$.

Milgrom and Roberts suggest three ways (not modeled here) that an organization could respond to the prospect of such wasteful influence activities. First, an organization could reduce the effectiveness of the communication channel (e.g., increasing the noise in the public signal, $1/h$). Second, an organization could reduce the Principal's discretion to respond to the signal (thus operating more by ex ante rules than on ex post information). Finally, an

organization could adjust its internal structures and processes away from what would otherwise be optimal, to reduce members' incentives to manipulate information (e.g., reducing productivity to decrease the Agent's bias β).

3.1.2 Other Models

There are now many models of political behaviors under concentrated, distributed, and contested control. As one example of distributed control, Hermalin (1998) opened a literature on leadership using a model with N agents who take decisions $d_i \in D$ at cost $c(d_i)$ to create aggregate output $y = s \sum_{i=1}^N d_i$ in state s . As a simple version of Hermalin's model, suppose each party's payoff is y/N , gross of decision costs. In higher states of the world it is efficient for everyone to choose higher decisions (interpreted as working harder), but in all states of the world each agent would like the others to work harder.

One agent (the leader) has private information about s but the other actors (followers) are uninformed. The leader chooses her decision first; the followers observe the leader's decision and then simultaneously choose theirs. Hermalin constructs a separating equilibrium of this signaling game involving "leading by example," in which the leader's decision perfectly reveals s and the followers are then induced to copy the leader's decision.

Gibbons (2010) discusses further models of leadership, such as Brocas and Carrillo (2007) and Caillaud and Tirole (2007), as well as several recent models of committees (another instance of distributed control) and models of contested control, such as Skaperdas (1992) and Rajan and Zingales (2000).

3.2 Endogenous Architectures

Given the inefficiencies produced by political behaviors in models with fixed decision architectures, it is natural to ask whether changing the architecture could reduce the inefficiencies. Of course, changing the architecture also changes the eventual decisions, as well as the political behaviors, so the optimal architecture optimizes this pair of outcomes. To conserve space, we again focus on a single model.

3.2.1 Formal Versus Real Authority

Aghion and Tirole (1997) explore "rubber stamping," meaning that the boss has the formal authority, but approves the subordinate's recommendation without inspection, so the subordinate has the real authority, so his recommendation might disproportionately reflect his interests—another form of politics. Formally, suppose there are three possible projects,

indexed by $k = 1, 2, 3$. Project k delivers benefits B_k to the boss and b_k to the subordinate. One project is terrible for both parties: $B_k = b_k = -\infty$. The other two projects deliver benefits of 0 and $B > 0$ to the boss and 0 and $b > 0$ to the subordinate. With probability α , the payoffs from the latter two projects are (B, b) and $(0, 0)$; with probability $1-\alpha$, the payoffs from these projects are $(B, 0)$ and $(0, b)$.

Initially, neither party knows which project is the terrible one, nor which project is the good one for him or her. Both the boss and the subordinate can try to collect information about which project is which, but at a cost. If the boss incurs the cost $c_B(E)$, then the boss learns her own payoff on each project with probability E , but learns nothing with probability $1-E$. Similarly, if the subordinate incurs the cost $c_s(e)$, then the subordinate learns his own payoff on each project with probability e , but learns nothing with probability $1-e$ (where these events for the subordinate are independent of those for the boss).

To analyze the parties' incentives to collect information, consider what happens in the following three situations. First, if the boss becomes informed then she will choose the project that pays her B . Second, if the boss remains uninformed but the subordinate becomes informed, then the subordinate will recommend the project that pays him b ; even though the boss did not observe her own payoffs (and, by assumption, the subordinate does not observe the boss's payoffs), the boss will accept the subordinate's proposed project because its expected payoff to the boss is $\alpha B + (1-\alpha) \cdot 0 = \alpha B > 0$. Finally, if neither the boss nor the subordinate becomes informed, then neither party will want any project to be chosen, because of the severity of the terrible project. From these three situations, we can compute first the parties' expected payoffs and then their Nash equilibrium choices (E^*, e^*) .

Aghion and Tirole proceed to argue that, when the boss has formal authority over the decision, one way to give the subordinate greater real authority is to overload the boss (such as by keeping the boss busy with other matters), thereby increasing the boss's marginal cost of becoming informed. As a reduced-form example in this spirit, replace the boss's cost function $c_B(E)$ with the cost function $kc_B(E)$, where $k \geq 1$. Parallel analysis then produces equilibrium choices $(E^*(k), e^*(k))$. Changes in k cause $E^*(k)$ and $e^*(k)$ to move in opposite directions: if the boss works less then the subordinate works more, because the subordinate knows that he is likely to have the real authority to select the project.

So far, this is an analysis of political behavior (self-interested project choice under rubber-stamping) in a fixed architecture (the boss has the formal authority). Aghion and Tirole then propose a second model in which the subordinate has the formal authority (but the boss may have the real authority—exactly the opposite of the case just analyzed). In this

case, we can again compute the parties' expected payoffs and then their equilibrium choices (E^{**}, e^{**}). Under this new architecture, the subordinate picks the project whenever he is informed, instead of only when he is informed and the boss is not, so the subordinate's incentive to collect information is stronger than before ($e^{**} > e^*$). In contrast, the boss no longer picks the project whenever she is informed, but instead only when she is informed and the subordinate is not, so the boss's incentive to collect information is weaker than before ($E^{**} < E^*$). We reconsider this model in Section 3.3.

3.2.2 Other Models

There are now many models of political behaviors under endogenous decision architectures. As examples, three growing literatures concern (a) disobedience and dissent (e.g., Landier, Sraer, and Thesmar, 2009; Marino, Matsusaka, and Zabochnik, 2009; Van den Steen, forthcoming), (b) communication in organizations (e.g., Dessein, 2002; Alonso, Dessein, and Matouschek, 2008; Rantakari, 2008), and (c) incentives and control (e.g., Athey and Roberts, 2001; Prendergast, 2002; Zabochnik, 2002). See Gibbons (2010) for more on these and related subjects.

3.3 Relational Empowerment

This section considers an unremarked assumption in many models of endogenous architectures: that a principal can irrevocably delegate control rights to an agent (without in effect selling the agent the firm and becoming the agent's subordinate). Simply put, we now ask whether, below the top of an organization, control rights should be seen as owned or loaned?

We follow Milgrom and Roberts (1990) and Baker, Gibbons, and Murphy (1999) in taking the latter view: the principal may be able to use relational contracts to loan the agent control, but the principal remains the boss and can reassert control at will. The motivation for this approach comes from numerous case studies in which units within historically decentralized organizations found themselves more tightly controlled after circumstances changed (such as Foss (2003) on Oticon, on which more below).

To fix ideas, consider a corporate parent (Principal) and a product-development lab (Agent) owned by the parent. If the lab incurs cost $c(a)$ then either the lab develops a new product (with probability a) or not (with probability $1-a$). If a new product is developed, the parent can then market it, in which case the lab receives x and the parent receives y ; otherwise, both parties receive zero. Suppose that the lab always likes to see its products

marketed ($x > 0$), but a new product could either complement or cannibalize the parent's existing products (specifically, $y \in \{y_L, y_M, y_H\}$ where $y_L < y_M < 0 < y_H$).

Space constraints prevent not only a careful analysis but even a complete description of this model. Nonetheless, we now present the results from this model, hoping that Sections 2.3 and 3.2 built sufficient intuition. See Baker, Gibbons, and Murphy (1999) for a full description and analysis of a related model.

In a one-shot setting, if the parent has formal authority over marketing, it will market a product only if $y > 0$ (i.e., $y = y_H$), whereas if the lab has formal authority over marketing, it will market a product for all values of y (because $x > 0$). As in Section 2.3, however, things can be different in an ongoing relationship. We proceed by analogy, borrowing that Section's result that the bonus B is incentive-compatible if the present value of the net surplus exceeds the reneging temptation (i.e., $B \leq [V(B) - U_0]/r$).

For concreteness, suppose that it is efficient to market products with $y \geq y_M$. (Both ex post and ex ante efficiency considerations could underlie this assumption: ex post, perhaps $x + y_M > 0 > x + y_L$; ex ante, perhaps the lab expends much more effort if products with $y \geq y_M$ will be marketed rather than only those with $y = y_H$.) Analogous to $V(B)$ in Section 2.3, let V_{HM} denote the gross surplus from marketing new products with $y \geq y_M$. In addition, let U_0 denote the lab's payoff if it works on its own projects rather than working for the parent in a given period.

Consider a relational contract in which the parent is supposed to market products with $y \geq y_M$. The parent will be tempted *not* to market a product with $y = y_M$, and the size of the parent's reneging temptation will be $-y_M > 0$ (analogous to B). This relational contract is an equilibrium of the repeated game if $-y_M \leq [V_{HM} - U_0]/r$. This equilibrium can be seen as (limited) empowerment, enacted via a relational contract when the parent has formal authority: the parent allows the lab to market some products that are not in the parent's immediate interest ($y_M < 0$), but disallows others that are too costly ($y_L < y_M$).

In contrast, if the parties attempt to implement the same relational contract (namely, market products with $y \geq y_M$) when the lab has formal authority over marketing, the lab is tempted *to* market a product with $y = y_L$, and the size of the lab's reneging temptation is then $x > 0$. The same relational contract is thus an equilibrium of the repeated game under the new architecture if $x \leq [V_{HM} - U_0]/r$.

Depending on the values of $-y_M$ and x , the relational contract of interest might be feasible under one architecture but not the other. That is, it might be that $-y_M \leq [V_{HM} - U_0]/r$

but $x > [V_{HM} - U_0]/r$, or vice versa. This model thus provides a rationale for the formal allocation of control based on which architecture facilitates the superior relational contract. The resulting determinants of the efficient allocation of formal control in an ongoing relationship are importantly different from those in a one-shot setting.

Given all this, how should we interpret delegation or empowerment in organizations? The argument here is that empowerment is a promise (i.e., a relational contract, not a formal one). Nonetheless, it does matter who has formal control and there are ways to change who has it. Following Grossman and Hart (1986), we interpret a change in formal control as a change in the boundary of the firm: the *architecture* where the lab has the formal authority is a spin-off; the corporate parent charts the lab as a stand-alone company and sells its entire stake in the new firm. We then interpret the *equilibrium* in this architecture (where the new firm markets products with $y \geq y_M$) as an alliance—a relational contract between firms, in which the new firm restrains itself from actions that would harm its former parent badly (in exchange for ongoing research funding).

Before leaving this model of relational empowerment, it is useful to revisit the issue (from end of Section 2.3) of implementing this model in practice: the outcomes x and y would be complex objects rather than scalars, and it could be hard to specify which kinds of new products (i.e., which realizations of x and y) the parent is supposed to market. In short, this section has again focused entirely on the *credibility* of the parties' promises, ignoring potential imperfections in the *clarity* of these promises, but see Section 4.

3.4 Summary and Assessment

Given both the importance of power and politics in organizations and the long-standing research interest in these issues outside economics, it may seem surprising that economic modeling of the political approach to decision-making in organizations got off to a relatively slow start. My guess is that Krugman (1995: 27) supplied the answer (originally for economic geography but equally applicable here): “Like it or not, ... [in economics] the influence of ideas that have not been embalmed in models soon decays.”

Krugman's comment applies to both Sections 3.1 and 3.2. For example, models of political behaviors under fixed decision architectures can utilize standard game theory, and such models indeed began to emerge in the 1980s. Likewise, the literature on endogenous decision architectures accelerated when Aghion and Tirole's (1997) second model (where the subordinate has the formal authority) reinterpreted the Grossman-Hart-Moore property-rights

framework as a model of alternative decision architectures within organizations, not just between.

But Krugman's remark continues in more pointed fashion, bemoaning both "sensible ideas that could not be ... formalized" and "formalizable ideas that seemed to have missed the point" (p. 59). The challenge suggested by Section 3.3 regarding reinterpreting the property-rights framework as a model of alternative decision architectures within organizations is therefore to determine under what circumstances (if any) this reinterpretation might be a formalization that missed the point.

4. Path-Dependence¹⁰

This section differs from the previous two in three respects. First, this section is rich in evidence and only briefly speculates about possible theories. These differences arise because the underlying literature is at a very early stage (at least in organizational economics, especially on the theoretical side).

Second, this section seeks to broaden organizational economists' focus from almost exclusively on the "between" variance to also somewhat on the "within." That is, rather than ask how organizations confronting different circumstances should choose different structures and processes (as in Sections 1.1, 2, and 3), the question here is why organizations confronting seemingly similar circumstances sometimes perform at persistently different levels. In short, we are now asking whether internal organization can create competitive advantage—a question central to strategic management, if rarely asked in economics.

Third, this section joins a small but growing literature seeking to give the noun "manager" and (especially) the verb "to manage" greater prominence in organizational economics. Borrowing Mintzberg's (2004) distinction between "analysis" (deciding what to do) and "administration" (getting it done), we interpret most of the existing work in organizational economics as concerning the former, and we argue that important progress could now be made by addressing the latter.

Tying these three themes together, this section builds toward the ideas that otherwise similar enterprises may perform differently because (a) they have implemented different management practices, (b) some of these practices depend critically on relational contracts,

¹⁰ This section was developed in tandem with Gibbons and Henderson (2010), so Rebecca Henderson's crucial influences will be obvious in what follows. Furthermore, we could not have produced our joint work without enormous assistance from Nancy Beaulieu, Nicola Lacetera, and Tommy Wang, so their efforts were also critical here.

and (c) some of these relational contracts are not easy to imitate (between or even within firms). Relative to Sections 2.3 and 3.3, which argued that relational contracts are potentially very important in both the pricing and politics approaches (but analyzed stationary equilibria), this section makes the complementary point that path-dependence in the *non*-stationary dynamics of building and changing relationships may lead to heterogeneous outcomes. In short, sometimes a relational contract cannot simply be announced or imported but instead must be home-grown.

A standard question (from economists, if not strategy scholars or business practitioners) is whether persistent performance differences (hereafter, PPDs) really exist. That is, won't either competition or imitation eliminate performance differences among truly similar enterprises, in which case measured performance differences merely indicate unmeasured heterogeneity? These are good questions, as long as they really are questions (as opposed to assertions, immune to evidence). Section 4.1 therefore summarizes several kinds of microeconomic evidence suggesting that persistent performance differences among seemingly similar enterprises do exist. Section 4.2 then describes microeconomic evidence that PPDs are associated with measured management practices, and Section 4.3 drills deeper than even the focused microeconomic studies allow, discussing case studies of building and changing relational contracts.

Section 4.4 returns to theory, discussing emerging and potential models of path-dependence in building and changing relationships. Leibenstein (1969, 1987) was the first we know to outline our argument, using the language of the repeated Prisoners' Dilemma to suggest that under-performing enterprises (those inside the production possibility frontier, or "X-inefficient") might be stuck in Defect-Defect equilibria, whereas superior performers might have learned to play Cooperate-Cooperate. But while Leibenstein's argument made appealing use of the multiple equilibria familiar from repeated-game models, neither he nor subsequent models like those in Sections 2.3 and 3.3 spoke directly to "stuck in" or "learned to." More recently, Kreps (1990, 1996) pointed towards formal models of the latter issues, but the literature then was quiet for over a decade, until a recent awakening.

Finally, Section 4.5 discusses why it seems useful for organizational economists to study persistent performance differences.

4.1 Microeconomic Evidence of PPDs

This section offers fleeting sketches of several literatures that provide microeconomic evidence of PPDs among seemingly similar enterprises. There is no

perfect sample for this purpose; rather, we present a collage of evidence with a consistent central theme. See Gibbons and Henderson (2010) for greater depth.

4.1.1 Large-sample Studies

We begin with evidence from large-sample studies, which suggest that PPDs are not confined to a few exceptional industries. A large literature—Cubbin and Geroski (1987) and Rumelt (1991) were early contributors—has asked which has a larger influence on the profitability of a firm: the external workings of the market or the internal workings of the organization? A substantial share (often at least 30%) of the variation in firm profitability is attributable to persistent performance differences among firms, after controlling for industry and year effects.

Another large literature has estimated production functions. For example, in a series of papers on the effects of research and development on productivity, Griliches and Mairesse (1981, 1982, 1985; Griliches, 1986) discovered substantial heterogeneity in large samples of firms. Similar productivity differences have now been found using a variety of estimation techniques in data from around the world (including by Haltiwanger, Lane, and Spletzer (1999) and Klette (1999)) and shown to be persistent over 5-year periods and longer (including by Bailey, Hulten, and Campbell (1992) and Disney, Haskel, and Heden (2003)).

Of course, large samples create concerns that measured performance differences may arise because the firms are not sufficiently similar. We therefore turn next to more focused studies, within industry and sometimes within firm.

4.1.2 Focused Studies

In a classic study, Salter (1960) found that, in the British pig-iron industry during 1911–26, the best factory was almost twice as productive as the average one. Similarly, Argote, Beckman, and Epple (1990) examined the 2708 Liberty ships produced in 16 separate shipyards during World War II. The yards used essentially standardized designs and parts, and the Liberty Ship was the first (and, for most of the war, only) ship produced in the yards. Argote et. al. focus on learning curves and so report productivity regressions controlling for labor, capital, and the cumulative experience and accumulated knowledge in the yard. Shipyard fixed effects are included and the authors remark in a footnote that the “hypothesis that there are no yard-specific effects is rejected at a very high significance level ($p < 0.001$)” (p. 144).

Within a firm, Chew, Bresnahan, and Clark (1990) analyzed the 40 operating units in the commercial-food division of a large corporation. These units were very similar along

multiple dimensions (e.g., all were located in the U.S., employed low-skill labor, used the same technology, and produced similar products for similar customers), but the top-ranked unit was twice as productive as the bottom-ranked unit, even after controlling for local labor-market characteristics, size of the local product market, unionization, age of equipment, product quality, and local monopoly.

Similar findings exist for many other settings including steel mills, apparel manufacturing, pharmaceuticals, heart surgery, and semiconductor manufacturing. We therefore turn from documenting PPDs to explaining them.

4.2 Microeconomic Evidence on Management Practices (as a Source of PPDs)

To explain PPDs, one might study whether (a) the internal workings of firms differ and (b) these internal differences are systematically related to performance differences. In principle, such differences in inner workings might be anything from organizational boundaries (which inputs are made or bought, what knowledge is accessed through alliances) to organizational structures (functional, divisionalized, or matrix organizations) to organizational processes (information sharing across functions, resource allocation across projects). To create PPDs, however, the advantageous inner workings must be difficult to imitate, which militates against those that are crisp and formal (such as a make-or-buy decision or an organizational chart) and towards those that are soft or informal. We therefore consider management practices, asking whether differences in these practices are related to productivity differences and whether these practices might be difficult to imitate.

Bloom and Van Reenen (2007) surveyed 732 medium-sized manufacturing firms from four countries, collecting data on 18 management practices (regarding operations, monitoring, targets, and incentives), with each firm's implementation of each practice scored from 1 to 5. Over half of the overall variation in firms' average management scores is within country and three-digit industry. Furthermore, a firm's average score is highly correlated with its total factor productivity, profitability, Tobin's Q, sales growth and survival rate. In short, there is large-sample evidence both that management practices are heterogeneous and that management practices affect performance.

In a more focused study, Ichniowski, Shaw and Prennushi (1997) collected panel data on both physical output and a detailed set of management practices from 36 finishing lines in 17 steel minimills. The data include monthly observations on eight human-resource (HR) practices including incentives, screening, employment security, communication, and so on. Ichniowski, Shaw, and Prennushi (ISP) emphasize two findings: first, these HR practices are

observed in a few bundles, rather than being independently distributed; and second, different bundles are associated with substantial differences in productivity.

For our purposes, a third aspect of ISP's data is also worth noting: these HR practices may not be easy to imitate. For example, one of the questions about incentives was "Are operators covered by a 'nontraditional' incentive pay plan ... [that] is sensitive to quality?" (p. 294). It may be easy for an HR manager to answer this question for her plant and yet hard for an outsider to implement the relevant management practice in another plant. (Recall the discussion at the end of Section 2.3 about implementing relational incentive contracts.) Similarly, the question about employment security asked whether "the company has committed to a goal of long-term employment security" (p. 294). To me, these and other questions that ISP posed suggest roles for relational contracts—in the extents to which the pay plan is "sensitive to quality," the company has "committed" to employment security, and so on.

Continuing this theme, consider Henderson and Cockburn's (1994, 1996) studies of R&D productivity in the pharmaceutical industry. Using patent data at the research-program level for 10 firms in an unbalanced panel of about 20 years (with up to 39 research programs per firm), Henderson and Cockburn found that firm fixed effects account for a large share of the variation in research productivity at the research-program level. Using qualitative research methods, they developed measures of management practices at the firm level, such as promotion incentives for scientists to publish research ("ProPub") and concentration of decision-making over resource allocation ("Dictator"). Adding either firm dummies or the management variables to a baseline regression increases the R-squared statistic dramatically. When both the dummies and the management variables are included, the dummies and ProPub and Dictator remain significant.¹¹

As with the HR practices that ISP measured in steel mills, the management practices that Henderson and Cockburn measured in pharmaceutical research suggest roles for relational contracts. For example, exactly how strong are the incentives to publish research, and would these incentives be equally strong if a particular publication put the firm's intellectual property at risk?

In summary, the evidence presented in this section is meant to parallel the distinction in Sections 2 and 3 between formal versus informal instruments. That is, management practices

¹¹ The continued significance of the firm dummies suggests that the management variables are either imperfect or not the whole story.

may sound (and sometimes be) formal, but they often are importantly relational. We therefore turn next to case studies of building and changing relational contracts.

4.3 Case Studies of Building and Changing Relational Contracts

In this section we give brief descriptions of case studies intended to illustrate five related challenges in building or changing a relational contract: (1) Do the parties have a shared understanding? (2) Do they understand that their understanding is incomplete? (3) What happens when an incomplete understanding needs to be refined? (4) What happens when an understanding needs to be changed? (5) Can parties make provisions in advance for later changes? While we present only one case per challenge, many others could be presented as well. Furthermore, space constraints allow only the first case to be presented in any depth; see Gibbons and Henderson (2010) for richer descriptions.

4.3.1 Shared Understanding?

Stewart (1993) describes how Credit Suisse (CS), a large European bank, progressively increased its stake in the US investment bank First Boston, eventually assuming control and taking the company private under the name CS First Boston (CSFB). At the time, onlookers wondered how the firms' cultures would interact, particularly around pay issues such as the large annual bonus typically paid in Wall Street firms.

In 1990, the first year in which CS actively controlled the firm, all firms in the investment banking industry performed poorly. CSFB bankers were disappointed with their bonuses that year, but these bonuses were comparable to bonuses at other (poorly performing) investment banks. In 1991, CSFB improved its performance over the previous year, but performed somewhat worse than other top-bracket investment banking firms. CSFB bankers were disgruntled over their bonuses (now lower than those at competing firms), but the organization was still relatively new, and promises were made about "getting the bonuses right" the following year. In 1992, however, CSFB performed better than in '91 but now strictly worse than its competitors and bonuses were projected to be strictly lower than at other firms, causing a crisis at the firm.

Roughly speaking, the Wall Street bankers asserted that the bonus policy in their industry was match-the-market (MTM), meaning that bonuses would be competitive with bonuses at other top-bracket firms. In contrast, the Swiss asserted that in *their* industry the bonus policy was pay for performance (PFP), meaning that a banker's bonus depended on how he and his bank performed.

One notable feature of this case is that these two policies, MTM and PFP, make identical pay prescriptions when all firms in the industry have the same performance, as was broadly true in 1990 and '91. This is a more general point: parties with different understandings may not appreciate that this difference exists until key events occur. A second notable feature of this case is that, regardless of what CS or FB actually thought in either 1990 or 1992, the fact that each could assert in 1992 that it thought its policy was in force implies that this policy cannot have been common knowledge in 1990.

4.3.2 Other Challenges

Incomplete understandings: Consider one of the pharmaceutical firms that Henderson and Cockburn (1994, 1996) later coded as among the first in the industry to be “ProPub” (i.e., to offer promotion incentives for scientists to publish research). When such a firm was beginning to articulate and implement this personnel practice, prospective employees may have had concerns about both the credibility and the clarity of what they were being told. For example, a recruiter from such a firm might have told a post doc from an academic program that “Coming to work with us will be almost like being an assistant professor” (but perhaps with higher pay). The analogy to an academic job would have been intended to signal the significant departure by this firm from the rest of the industry’s continuing practice of not encouraging (or even prohibiting) employees to publish their research, but both the recruiter and the post doc would have known that the analogy had its limits (hence the “almost”).

Refining an understanding: The Danish hearing-aid firm Oticon initiated radical empowerment of its product-development projects with a memo from CEO Lars Kolind titled “Think the Unthinkable” that envisioned project groups as akin to mini-businesses, each with its own resources, timeline, goals, and incentives. The initial results were strong, which subsequent commentators ascribed to “market forces” having been unleashed in the new organization (see Foss (2003) for discussion). But it is unclear whether Oticon’s project managers interpreted the market metaphor as an initial approximation (akin to “almost like being an assistant professor”) or something closer to literal. If the former, then they would have expected the metaphor to be refined as events unfolded, clarifying just how much autonomy project managers actually would have in the new organization; if the latter, then they may have been surprised and upset (perhaps akin to the Wall Street bankers at CSFB) when the firm’s Projects and Products Committee (staffed by the CEO and three senior managers) tightened control after the firm’s portfolio of projects spiraled into disarray.

Changing the deal: In 1981, the cover of Johnson & Johnson’s annual report read “Decentralization = Creativity = Productivity” (Aguilar and Bhambri, 1986: 1). For decades

before and after, J&J was comprised of many disparate and nearly autonomous health-care businesses, ranging in size from a handful to thousands of employees. While the substantial freedom given (no, *loaned*) to each business was thought to increase innovation and initiative, it also made coordination more difficult. For example, some hospitals requested that a single J&J salesperson visit them, rather than one from each of the J&J companies that might sell to the hospital. In principle, the solution to this request was straightforward—create a new business handling hospital sales and distribution for the relevant J&J companies—but having corporate headquarters create this new business must have raised questions for the existing businesses: if headquarters was prepared to limit these businesses' historical autonomy in this way now, what would happen in the future?

Providing for change: For over 50 years since its founding, the electronics firm Hewlett-Packard did not have a layoff. In the early 1990s, however, firm performance declined and employment practices were reconsidered, producing concerns among employees that the firm was about to renege. Rogers and Beer (1995: 1) describe how a simple diagram eventually proved useful—at least in shaping expectations about the future. The figure involves three concentric circles labeled “values” (innermost), “objectives” (middle), and “practices” (outer), suggesting that the firm’s values never change (akin to being written on stone tablets), while the objectives follow from the values but may change slowly over time (written in clay), and the practices follow from the objectives and may change frequently (written on a whiteboard). The firm then used the diagram to argue that employment security had never been a value but instead was an objective or even a practice; that is, the firm could have a layoff but preserve its values. Regardless of whether this diagram persuaded Hewlett-Packard’s employees at the time, its three nested time-scales seem worth considering in other settings where relational contracts must provide for change.

4.4 *Towards New Theories*

Some of the issues raised by these case studies of relational contracts are beginning to appear in models. Three themes in this developing literature seem particularly promising: learning to coordinate, learning to communicate, and learning to cooperate. In these theories, path-dependence produces results consistent with Winter’s (2004) observation that “Routines [or, here, equilibria] are necessarily home-grown.” To streamline the discussion of these theories, we treat not only the first topic but also the second under the assumption that the parties have shared interests, introducing conflicting interests only in discussing “learning to cooperate.” In addition to theory, there are also intriguing experiments on these issues; see Gibbons and Henderson (2010).

4.4.1 *Learning to Coordinate*

In a game with Pareto-ranked Nash equilibria and zero payoff to all players out of equilibrium, a focal point (Schelling, 1960) may command everyone's attention. But what if multiple Nash equilibria offer the best payoff, or some of the payoffs out of equilibrium are very negative (making coordination failure very costly)? Furthermore, what if the parties cannot easily discuss the opportunities they perceive (as when an organization has congealed into functional silos and, say, the production and marketing groups have only a rudimentary language in common)?

Crawford and Haller (1990) provide a pioneering analysis of such issues in a repeated coordination game. One of their important insights is that, absent a common language about actions (e.g., about the detailed production and marketing activities that might be useful in concert), the parties' shared experience may facilitate coordination by allowing decentralized partners to label their action spaces in terms of past play.

Blume and Franco (2007) continue in this spirit, analyzing an n -player, m -action coordination game with k "successes" (Nash equilibria paying 1 to all players) and $m^n - k$ "failures" (action-tuples where all players receive 0). The parties know the number of successes but not the action-tuples that will achieve them. Each player observes his own actions and payoffs but not the actions of other players. The optimal strategy entails mixing (until a success is reached) so that the players do not all change their actions in lock-step (which would cause the players to revisit unsuccessful action-tuples). As a result of this mixing, different groups of n players could take different durations to find a success.

Whereas Blume and Franco call their work "Decentralized learning from failure," Ellison and Holden (2009) take a more hierarchical approach, in which a Principal instructs an Agent. Each period, (1) the Agent observes the state of the world, $s \in S$; (2) the Agent chooses an action $a \in A$; (3) the Principal sends a message $m \in M$ to the Agent; and (4) both parties receive the payoff $\pi(a, s)$. A novel aspect of the model is that the Principal cannot communicate about a state until that state has been realized. More specifically, the Principal's message dictates that if a future state is within a specified neighborhood of this period's state then the Agent should take a specified action.¹² When messages are of this form, there are more and less useful realizations of s that may occur in early periods; in particular, a useful realization is one that allows the Principal to specify a broad neighborhood. As a result, dyads whose early realizations of s are useful will perform better.

¹² A related game would involve coordination if the Principal also chose an action and both parties receive $\pi(a, s)$ only if their actions match.

4.4.2 *Learning to Communicate*

In addition to learning to coordinate, a complementary challenge is building a language, as in the following repeated game. In each period, (1) the Sender observes the state of the world, $s \in S$; (2) the Sender sends a message $m \in M$ to the Receiver; (3) the Receiver chooses an action $a \in A$; (4) both parties receive a payoff of 1 if the Receiver's action is $a^*(s)$ and 0 otherwise; and (5) the Receiver observes the state. Suppose that both parties know the action rule $a^*(s)$, so the only challenge is for the Sender to communicate the state to the Receiver each period: they need shared understanding of an invertible mapping $m : S \rightarrow M$.

If the message space includes the state space, $S \subseteq M$, then truth-telling seems focal: the Sender can choose $m(s) = s$. But if S and M bear no relation to each other (e.g., S might be fruits exported by Brazil and M might be Kings of England) then building a shared language seems likely to be a painstaking process, with the Receiver learning the code for each new state after it first arises (e.g., "Henry VIII" means cantaloupe). The interesting cases are between these two extremes, where learning may accelerate if (i) the parties share some understanding before the game begins, and perhaps (ii) a useful realization of s occurs early in a dyad's relationship. As an example of (i), Blume (2000) defines a partial language as a set of mappings that the parties understand in advance to be the only mappings the Sender might use. If this set is strictly smaller than the set of all possible mappings, then the partial language contains information that may accelerate learning (sometimes a great deal).

4.4.3 *Learning to Cooperate*

Chassang (forthcoming) analyzes how a Principal and Agent can build a relational contract. In each period, the Principal first chooses whether to invest or not, where investing imposes a cost k on the Principal but delivers a benefit b to the Agent (and not investing delivers zero to both parties and ends that period). If the Principal does invest then the actions $a \in A$ is feasible with (independent) probability p , and both parties observe which actions are feasible that period.

There are two kinds of actions, unproductive and productive: $A = A_U \cup A_P$. An unproductive action costs nothing for the Agent to take but produces no output for the Principal, whereas a productive action costs c to take and produces output $\tilde{y}(a)$, where $\tilde{y}(a) = y(a) > 0$ with probability q and $\tilde{y}(a) = 0$ with probability $1-q$. It is common knowledge that the number of productive actions is $\#A_P$ and that a given productive action $a_p \in A_P$ produces $y(a_p)$ when it produces positive output, but initially only the Agent knows which actions are the productive ones.

As a simple case, suppose it is common knowledge that there are two productive actions, a_0 and a_1 , with $y(a_0) < y(a_1)$. In the first period, a_0 might be feasible but a_1 not, or the reverse, or both might be feasible, or neither. To induce the Agent to take a new productive action instead of an unproductive action, the Principal threatens not to invest in several future periods if this period's output is zero. Note that this punishment will occur on the equilibrium path, because a productive action could produce zero output. In this sense, learning (i.e., identifying a new action as productive) is expensive. On the other hand, if an action has produced a positive output then the Principal knows that the action is productive, so if the Agent takes this action in a later period and it produces zero output then the Principal does not need to punish the Agent.

Because learning is expensive (in the sense of punishments, and also in the sense of opportunity cost after at least one productive action has been identified), it can be optimal to stop learning before all productive actions are identified. Because opportunities to learn arrive randomly, otherwise identical dyads may stop learning after identifying different sets of productive actions. Thus, this model can produce persistent performance differences among otherwise similar dyads because of path-dependence in building a relational contract.

4.5 Conclusion

I find the disjunction between the literatures in organizational economics and strategy striking. On one hand, the major research streams in organizational economics—including the huge literature on firms' boundaries, the large literature on the pricing approach, and the rapidly growing literature on the political approach—are all sharply focused on the between variance, both empirically and theoretically; PPDs are essentially absent. On the other hand, asking whether internal organization can create competitive advantage is a central question in strategic management. Drawing in part on the large and active “capabilities” segment of the strategy literature (see Gibbons and Henderson (2010) for discussion and references), I close this essay with three reasons why it seems important for organizational economists to study persistent performance differences (whether by adopting this section's focus on path-dependence in building and changing relational contracts or by some other means).

First, PPDs are already important in fields of economics that assume (indeed, rely) on the existence of such differences. The literature on industry dynamics (e.g., Ericson and Pakes, 1995: 53, *italics added*) provides one example: “We provide a model of industry behavior which, because it incorporates ... *firm-specific* sources of uncertainty, can generate the variability in the fortunes of firms observed in these data.” And the literature on

adjustments to trade shocks (e.g., Melitz, 2003: 1695, italics added) provides another: “This paper develops a dynamic industry model with *heterogeneous* firms to analyze the role of international trade as a catalyst for ... inter-firm reallocations within an industry.” In short, these literatures not only are prepared to assert that PPDs exist but also find them useful for exploring other empirical domains. On the other hand, these literatures have so far taken the pragmatic approach of positing rather than explaining the existence of such differences.

Second, the causes of PPDs may be important for policy. Since at least Cyert and March (1963), one reason to understand how organizations make decisions has been to predict how policy changes may cause changes in organizational behaviors. Cyert and March focused on how firms choose prices, but the same principle applies much more broadly—both to other decisions firms make and to a range of policy initiatives that may influence these decisions. I find it easy to imagine that the forces inside organizations that create PPDs may also cause organizations to respond to policy initiatives differently than would be predicted from the assumption that firms costlessly and constantly optimize their choices from a fixed and known production possibility set.

Finally, and most importantly, PPDs are important for economic well-being. For example, making General Motors as productive as Toyota could constitute a substantial improvement for GM’s workforce, shareholders, and beyond. In this respect, evidence of PPDs has inspired in me a reaction similar to Lucas’s (1988: 5) response to heterogeneous income levels and growth rates across countries: “I do not see how one can look at figures like these without seeing them as representing *possibilities*. ... This is what we need a theory ... *for*: to provide some kind of framework for organizing facts like these, for judging which represent opportunities and which necessities” (italics in the original).

References

- Abreu, Dilip. 1988. "On the Theory of Infinitely Repeated Games with Discounting." *Econometrica* 56: 383-96.
- Aghion, Philippe and Jean Tirole. 1997. "Formal and Real Authority in Organizations." *Journal of Political Economy* 105:1-29.
- Aguilar, Francis and Arvind Bhambri. 1986. "Johnson & Johnson (B): Hospital Services." Harvard Business School Case #384-054.
- Alonso, Ricardo, Wouter Dessein, and Niko Matouschek. 2008. "When Does Coordination Require Centralization?" *American Economic Review* 98: 145-79.
- Argote, L., S. Beckman, D. Eppler. 1990. "The Persistence and Transfer of Learning in Industrial Settings," *Management Science* 36: 140-54.
- Athey, Susan, and John Roberts. 2001. "Organizational Design: Decision Rights and Incentive Contracts." *American Economic Review* 91: 200-05.
- Azoulay, Pierre and Josh Lerner. 2010. "Technological Innovation and Organizations." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Bailey, Martin, Charles Hulten, and David Campbell. 1992. "Productivity Dynamics in Manufacturing Plants." *Brookings Papers on Economic Activity, Microeconomics* 1992: 187-267.
- Baker, George. 1992. "Incentive Contracts and Performance Measurement." *Journal of Political Economy* 100: 598-614.
- Baker, George. 2002. "Distortion and Risk in Optimal Incentive Contracts." *Journal of Human Resources* 37: 728-751.
- Baker, George and Ricard Gil. 2010. "Clinical Papers in Organizational Economics." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Baker, George, Robert Gibbons, and Kevin J. Murphy. 1994. "Subjective Performance Measures in Optimal Incentive Contracts." *Quarterly Journal of Economics* 109:1125-56.
- Baker, George, Robert Gibbons, and Kevin J. Murphy. 1999. "Informal Authority in Organizations." *Journal of Law, Economics, and Organization* 15: 56-73.
- Baker, George, Robert Gibbons, and Kevin J. Murphy. 2002. "Relational Contracts and the Theory of the Firm." *Quarterly Journal of Economics* 117: 39-83.
- Banerjee, Abhijit, Rema Hanna, and Sendhil Mullainathan. 2010. "Corruption in Public and Private Governance." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.

- Baron, James and David Kreps. 2010. "Employment as an Economic **and** a Social Relationship." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Baum, Joel. 2002. *Companion to Organizations*. Oxford UK: Blackwell.
- Blois, K. 1972. "Vertical Quasi-Integration." *Journal of Industrial Economics* 20: 253-72.
- Bloom, Nicholas and John Van Reenen. 2007. "Measuring and Explaining Management Practices Across Firms and Countries." *Quarterly Journal of Economics* 122: 1351-408.
- Blume, Andreas and April Franco. 2007. "Decentralized learning from failure." *Journal of Economic Theory* 133: 504-23.
- Bresnahan, Timothy and Jonathan Levin. 2010. "Vertical Integration and Market Structure." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Brocas, Isabelle and Juan Carrillo. 2007. "Influence through ignorance." *Rand Journal of Economics* 38: 931-47.
- Brynjolfsson, Erik and Paul Milgrom. 2010. "Complementarity in Organizations." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Bull, Clive. 1987. "The Existence of Self-Enforcing Implicit Contracts." *Quarterly Journal of Economics* 102: 147-59.
- Caillaud, Bernard and Jean Tirole. 2007. "Consensus Building: How to Persuade a Group." *American Economic Review* 97: 1877-1900.
- Camerer, Colin and Roberto Weber. 2010. "Experimental Organizational Economics." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Chassang, Sylvain. Forthcoming. "Building Routines: Learning, Cooperation and the Dynamics of Incomplete Relational Contracts." Forthcoming, *American Economic Review*.
- Chew, W. Bruce, Timothy Bresnahan, and Kim Clark. 1990. "Measurement, Coordination, and Learning in a Multiplant Network." In R. Kaplan (ed.), *Measures for Manufacturing Excellence*. Boston: Harvard Business School Press.
- Coase, Ronald. 1937. "The Nature of the Firm," *Economica* 4: 386-405.
- Coase, Ronald. 1992. "The Institutional Structure of Production." *American Economic Review* 82: 713-19.
- Crawford, Vincent and Hans Haller. 1990. "Learning How to Cooperate: Optimal Play in Repeated Coordination Games." *Econometrica* 58: 571-95.
- Crozier, Michel. 1964. *The Bureaucratic Phenomenon*. Chicago: University of Chicago Press.
- Cubbin, J. and P. Geroski. 1987. "The convergence of profits in the long run: inter-firm and inter-industry comparisons." *Journal of Industrial Economics* 35: 427-42.
- Cyert, Richard and James March. 1963. *A Behavioral Theory of the Firm*. Englewood Cliffs, NJ: Prentice-Hall. Second edition, 1992. Oxford: Blackwell Publishers.

- Datar, Srikant, Susan Kulp, and Richard Lambert. 2001. "Balancing Performance Measures." *Journal of Accounting Research* 39: 75-92.
- DeGroot, Morris. 1970. *Optimal Statistical Decisions*. New York, NY: John Wiley & Sons.
- Dessein, Wouter. 2002. "Authority and Communication in Organizations." *Review of Economic Studies* 69: 811-38.
- Disney, R., J. Haskel and Y. Heden, 2003. "Restructuring and productivity growth in UK Manufacturing." *The Economic Journal* 113: 666-694.
- Ellison, Glenn and Richard Holden. 2009. "A Theory of Rule Development." Unpublished manuscript, University of Chicago.
- Ericson, Richard and Ariel Pakes. 1995. "Markov-Perfect Industry Dynamics: A Framework for Empirical Work." *Review of Economic Studies* 62: 53-82.
- Fast, Norman and Norman Berg. 1975. "The Lincoln Electric Company." Harvard Business School Case #376-028.
- Feltham, Gerald, and Jim Xie. 1994. "Performance Measure Congruity and Diversity in Multi-Task Principal/Agent Relations." *The Accounting Review* 69: 429-53.
- Foss, Nicolai. 2003. "Selective Intervention and Internal Hybrids: Interpreting and Learning from the Rise and Decline of the Oticon Spaghetti Organization." *Organization Science* 14: 331-49.
- Fuchs, William. 2007. "Contracting with Repeated Moral Hazard and Private Evaluations." *American Economic Review* 97: 1432-48.
- Garicano, Luis and Timothy Van Zandt. 2010. "Hierarchies and the Division of Labor." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Gertner, Robert and David Scharfstein. 2010. "Corporate Resource Allocation." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Gibbons, Robert. 2003. "Team theory, garbage cans and real organizations: some history and prospects of economic research on decision-making in organizations." *Industrial and Corporate Change* 12: 753-87.
- Gibbons, Robert. 2005a. "Four formal(izable) theories of the firm?" *Journal of Economic Behavior and Organization* 58: 200-45.
- Gibbons, Robert. 2005b. "Incentives Between Firms (and Within)." *Management Science* 51: 2-17.
- Gibbons, Robert. 2010. "Political Models of Organizational Decision-Making." Unpublished manuscript, MIT.
- Gibbons, Robert and Rebecca Henderson. 2010. "Relational Contracts and the Origins of Organizational Capabilities." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Gibbons, Robert and John Roberts. 2010a. *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Gibbons, Robert and John Roberts. 2010b. "Incentives in Organizations." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.

- Griliches, Zvi. 1986. "Productivity, R&D, and Basic Research at the firm level in the 1970s." *American Economic Review* 76: 141-54.
- Griliches, Zvi and Jacques Mairesse. 1981. "Productivity and R&D at the Firm Level." NBER Working Paper #826.
- Griliches, Zvi and Jacques Mairesse. 1982. "Comparing Productivity Growth: An Exploration of French and US Industrial and Firm Data." NBER Working Paper #961.
- Griliches, Zvi and Jacques Mairesse. 1985. "R&D and Productivity Growth: Comparing Japanese and US Manufacturing Firms." NBER Working Paper #1778.
- Grossman, Sanford and Oliver Hart. 1983. "An Analysis of the Principal-Agent Problem," *Econometrica* 51: 7-45.
- Grossman, Sanford and Oliver Hart. 1986. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Ownership." *Journal of Political Economy* 94: 691-719.
- Haltiwanger, J., J. Lane, and J. Spletzer. 1999. "Productivity Differences Across Employers: The Roles of Employer Size, Age, and Human Capital." *American Economic Review* 89: 94-98.
- Hart, Oliver. 1995. *Firms, Contracts, and Financial Structure*. Oxford: Clarendon Press.
- Hart, Oliver, and John Moore. 1990. "Property Rights and the Nature of the Firm." *Journal of Political Economy* 98: 1119-58.
- Henderson, Rebecca and Kim Clark. 1990. "Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms." *Administrative Science Quarterly* 35: 9-30.
- Henderson, Rebecca and Ian Cockburn. 1994. "Measuring Competence? Exploring Firm Effects in Pharmaceutical Research." *Strategic Management Journal* 15: 63-84.
- Henderson, Rebecca and Ian Cockburn. 1996. "Scale, Scope, and Spillovers: The Determinants of Research Productivity in Drug Discovery." *Rand Journal of Economics* 27: 32-59.
- Hermalin, Benjamin. 1998. "Toward an Economic Theory of Leadership: Leading By Example." *American Economic Review* 88: 1188-1206.
- Hermalin, Benjamin. 2010. "Economic Models of Corporate Governance." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Holmstrom, Bengt. 1979. "Moral Hazard and Observability," *Bell Journal of Economics*, 10: 74-91.
- Holmstrom, Bengt. 1982/1999. "Managerial Incentive Problems—A Dynamic Perspective." In *Essays in Economics and Management in Honor of Lars Wahlbeck*. Helsinki: Swedish School of Economics. Republished in *Review of Economic Studies* 66: 169-82.
- Holmstrom, Bengt. 1999. "The Firm as a Subeconomy." *Journal of Law, Economics, and Organization* 15: 74-102.
- Holmstrom, Bengt, and Paul Milgrom. 1991. "Multitask Principal-Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design." *Journal of Law, Economics, and Organization* 7: 24-52.
- Holmstrom, Bengt and Paul Milgrom. 1994. "The Firm as an Incentive System." *American Economic Review* 84: 972-91.

- Holmstrom, Bengt, and Jean Tirole. 1991. "Transfer Pricing and Organizational Form." *Journal of Law, Economics, and Organization* 7: 201-28.
- Ichniowski, Casey, Kathryn Shaw, and Giovanna Prennushi. 1997. "The Effects of Human Resource Management Practices on Productivity: A Study of Steel Finishing Lines." *American Economic Review* 87: 291-313.
- Ichniowski, Casey and Kathryn Shaw. 2010. "Insider Econometrics: A Roadmap to Estimating Empirical Models of Organizational Performance." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Kerr, Steven. 1975. "On the Folly of Rewarding A, While Hoping for B." *Academy of Management Journal* 18:769-83.
- Klein, Benjamin, Robert Crawford, and Armen Alchian. 1978. "Vertical Integration, Appropriable Rents and the Competitive Contracting Process." *Journal of Law and Economics* 21: 297-326.
- Klette, Tor Jakob. 1999. "Market Power, Scale Economies and Productivity: Estimates from a Panel of Establishment Data." *Journal of Industrial Economics* 47: 451-76.
- Knight, F., 1921. *Risk, uncertainty, and profit*. New York: Hart, Schaffner, and Marx; repr. (1964) New York: Harper and Row.
- Kreps, David. 1990. "Corporate Culture and Economic Theory." In J. Alt and K. Shepsle, eds. *Perspectives on Positive Political Economy*. Cambridge University Press.
- Kreps, David. 1996. "Markets and Hierarchies and (Mathematical) Economic Theory." *Industrial and Corporate Change* 5: 561-95.
- Krugman, Paul. 1995. *Development, geography, and economic theory*. Cambridge, MA: MIT Press.
- Lafontaine, Francine and Margaret Slade. 2010. "Inter-Firm Contracts: Evidence." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Landier, Augustin, David Sraer, and David Thesmar. 2009. "Optimal Dissent in Organizations." *Review Economic Studies* 76: 761-94.
- Lazear, Edward and Paul Oyer. 2010. "Personnel Economics." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Leibenstein, Harvey. 1969. "Organizational or Frictional Equilibria, X-Efficiency, and the Rate of Innovation." *Quarterly Journal of Economics* 83: 600-23.
- Leibenstein, Harvey. 1987. *Inside the Firm: The Inefficiencies of Hierarchy*. Cambridge, MA: Harvard University Press.
- Levin, Jonathan. 2003. "Relational Incentive Contracts." *American Economic Review* 93: 835-57.
- Lucas, Robert. 1988. "On the Mechanics of Economic Development." *Journal of Monetary Economics* 22: 3-42.
- MacLeod, Bentley. 2007. "Reputations, Relationships, and Contract Enforcement." *Journal of Economic Literature* 45: 595-628.

- MacLeod, Bentley, and J. Malcomson. 1989. "Implicit contracts, incentive compatibility, and involuntary unemployment." *Econometrica* 57: 447-480.
- Malcomson, James. 2010. "Relational Incentive Contracts." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Marino, Anthony, John Matsusaka, and Ján Zábajník. 2009. "Disobedience and Authority." *Journal of Law, Economics, and Organization* xx: yy-zz.
- Marschak, Jacob and Roy Radner. 1972. *Economic Theory of Teams*. New Haven, CT: Yale University Press.
- Melitz, Marc. 2003. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica* 71: 1695-1725.
- Menard, Claude. 2010. "Hybrid Modes of Organization: Alliances, Joint Ventures, Networks, and other 'strange' animals." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Milgrom, Paul and John Roberts. 1988. "An Economic Approach to Influence Activities in Organizations." *American Journal of Sociology* 94: S154-S179.
- Milgrom, Paul and John Roberts. 1990. "Bargaining Costs, Influence Costs and the Organization of Economic Activity." In J. Alt and K. Shepsle (eds.), *Perspectives on Positive Political Economy*. Cambridge: Cambridge University Press.
- Mintzberg, Henry. 2004. *Managers, Not MBAs*. San Francisco, CA: Berrett-Koehler.
- Mirrlees, James. 1975/1999. "The Theory of Moral Hazard and Unobservable Behaviour: Part I." Unpublished manuscript, Nuffield College. Published in *Review of Economic Studies* 66: 3-21.
- Moe, Terry. 2010. "Public Bureaucracy and the Theory of Political Control." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Nelson, Richard. 1991. "Why Do Firms Differ, and How Does It Matter?" *Strategic Management Journal* 12: 61-74.
- Penrose, Edith. 1959. *The Theory of the Growth of the Firm*. New York, NY: Wiley.
- Pigou, Alfred. 1932. *The Economics of Welfare*. London: Macmillan.
- Prendergast, Canice. 2002. "The Tenuous Trade-Off Between Risk and Incentives," *Journal of Political Economy* 110: 1071-1102.
- Rajan, Raghuram and Luigi Zingales. 2000. "The Tyranny of Inequality." *Journal of Public Economics* 76: 521-58.
- Rantakari, Heikki. 2008. "Governing Adaptation." *Review of Economic Studies* 75: 1257-85.
- Richardson, George. 1972. "The Organisation of Industry." *Economic Journal* 82: 883-96.
- Rogers, Gregory and Michael Beer. 1995. "Human Resources at Hewlett-Packard (A) and (B)." Harvard Business School Cases #9-495-051 and 9-495-052.
- Rumelt, R. 1991. "How Much Does Industry Matter?" *Strategic Management Journal* 12: 167-85.
- Salter, W. 1960. *Productivity and Technical Change*. Cambridge: Cambridge University Press.

- Schelling, Thomas. 1960. *The Strategy of Conflict*. Cambridge, MA: Harvard University Press.
- Segal, Ilya and Michael Whinston. 2010. "Property Rights." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Skaperdas, Stergios. 1992. "Cooperation, Conflict, and Power in the Absence of Property Rights." *American Economic Review* 82: 720-39.
- Smelser, Neil and Richard Swedberg. 2005. *The Handbook of Economic Sociology*. Second edition. Princeton, NJ: Princeton University Press.
- Stewart, James. 1993. "Taking the Dare." *The New Yorker*, July 26, 1993: 34-39.
- Tadelis, Steven. 2010. "Transaction Cost Economics." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Teece, David, Gary Pisano, and Amy Shuen. 1997. "Dynamic Capabilities and Strategic Management." *Strategic Management Journal* 18: 509-33.
- Van den Steen, Eric. Forthcoming. "Interpersonal Authority in a Theory of the Firm." Forthcoming, *American Economic Review*.
- Waldman, Michael. 2010. "Theory and Evidence in Internal Labor Markets." Forthcoming in R. Gibbons and J. Roberts (eds.), *The Handbook of Organizational Economics*. Princeton, NJ: Princeton University Press.
- Williamson, Oliver. 1971. "The Vertical Integration of Production: Market Failure Considerations." *American Economic Review* 63: 316-25.
- Williamson, Oliver. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*. New York, NY: Free Press.
- Williamson, Oliver. 1979. "Transaction Cost Economics: The Governance of Contractual Relations." *Journal of Law and Economics* 22: 233-61.
- Williamson, Oliver. 1991. "Comparative Economic Organization: The Analysis of Discrete Structural Alternatives." *Administrative Science Quarterly* 36: 269-96.
- Winter, Sydney. 1988. "On Coase, Competence, and the Corporation." *Journal of Law, Economics, and Organization* 4: 163-80.
- Winter, Sydney. 2004. "Lectures on Routines and Capabilities." MIT's Sloan School, March.
- Zabojnik, Jan. 2002. "Centralized and Decentralized Decision Making in Organizations." *Journal of Labor Economics* 20: 1-22.